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IT EDUCATION AND THE KNOWLEDGE SOCIETY AN AUSTRALIAN PERSPECTIVE

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Abstract: At the University of Canberra, we envision a society that has the capacity to act in a knowledgeable and responsible way that is continually enhanced by its sophisticated use of information technologies. In the School of Information Sciences and Engineering, we need to educate the IT professionals who will facilitate such a society through the design of work practices, business processes and IT-based systems. In this paper, we present our understanding of the environment, the requirements of our clients, our new courses and our approaches to flexible learning. The primary requirement is to develop business analysts with the communication skills to bridge between software developers and business clients. We describe the new courses we designed to address this requirement and our approaches to flexible learning to support the needs of students.

1. INTRODUCTION

This paper presents our response to the new knowledge society and the evolving nature of IT work. Most immediately for us, from a university perspective, the issue is to match the changing demands, in a turbulent environment, for IT professionals for this society. We present our response in an Australian context, including new initiatives in our university. Our response is based on an analysis of our clients' needs, using panels of experts from business and government, and by benchmarking against other universities and issues raised in the literature. The result is a new

undergraduate and graduate course in business informatics using flexible learning to match the changing life-styles of students.

2. KNOWLEDGE SOCIETY

The knowledge society, especially as it affects large service-providing public organisations, requires the proper management of information to support service delivery, management decision-making and strategic planning, to enable communities and individuals to engage with services and contribute to policy development. Not only this, the knowledge society requires that a range of people are involved in systems design and development, that many perspectives are represented in design and analysis teams and that many perspectives are collected from across the community. Several Australian Government IT policy agencies have identified the need, for example, the Department of Communication, Information Technology and the Arts (DCITA) states "...ICT has a broader role-as a set of enabling technologies and related products and services which underpin the development of Australia as an "Information" or "Knowledge" economy. An ICT capability in this sense is critical to the achievement of national goals in areas as diverse as security and defence, demographic change, science and innovation, education and health". ([5], p5). The Australian Public Service Commission (APSC) emphasises the need for enabling information management approaches, "It is no longer enough for online service delivery to be an add-on or after-thought or simply to be "Overlayed" on existing service delivery channels. The online channel is not merely for information and service delivery. It drives new approaches to information management that enable the integration of information and services" [2].

Overall, the Australian (and international) environment leads to the following conclusion, as expressed by the Australian National Office of the Information Economy (NOIE): "Information and communication technologies and services have become pervasive, general purpose enablers of economic and social transformation. Given the right policy settings, they provide the platforms on which growth in productivity, innovation and social well-being can be constructed". ([15], p9).

Australians are adopting E-government services, for example, the Australian Government Information Management Office, AGIMO (the renamed version of NOIE), reports that "The Internet is now a mainstream channel for contacting government" and "Thirty-nine percent of adults contacted government via the Internet over the past twelve months" ([1], p 1-6).

The Australian Government's Department of Communication, Information Technology and the Arts aims "To ensure that Australia can take advantage of the opportunities provided by the information economy" [7] and emphasises the importance of ICTs for the economy: "...If GDP grows in

2002 as forecast by 3.43%, then 1.66% of that 3.43% will have been contributed by ICT, and the remaining 1.77% from other causes. Put another way, GDP would only grow by 1.77% in the absence of advances in ICT, compared to the 3.43% it would grow with continued ICT advances" ([4], section 5.3.4). This indicates that effective use of information and communication technologies is essential for economic growth. This is supported by data about the extensive use of ICTs in business, for example as in [16].

3. THE CHANGING NATURE OF IT EMPLOYMENT AND WORK

Although there has been a downturn in IT employment in Australia [5], [7], [9] and, for example, the USA [17] and in enrolments in tertiary IT courses across Australia and the USA over the past 2-3 years [9], typically 50% [3], [17], figure 1 shows that the demand for IT professionals in Australia is now increasing [7], [10], just when the number of graduates has been significantly reduced. Australia's Department of Employment and Workplace Relations, DEWR, regularly reports these figures.

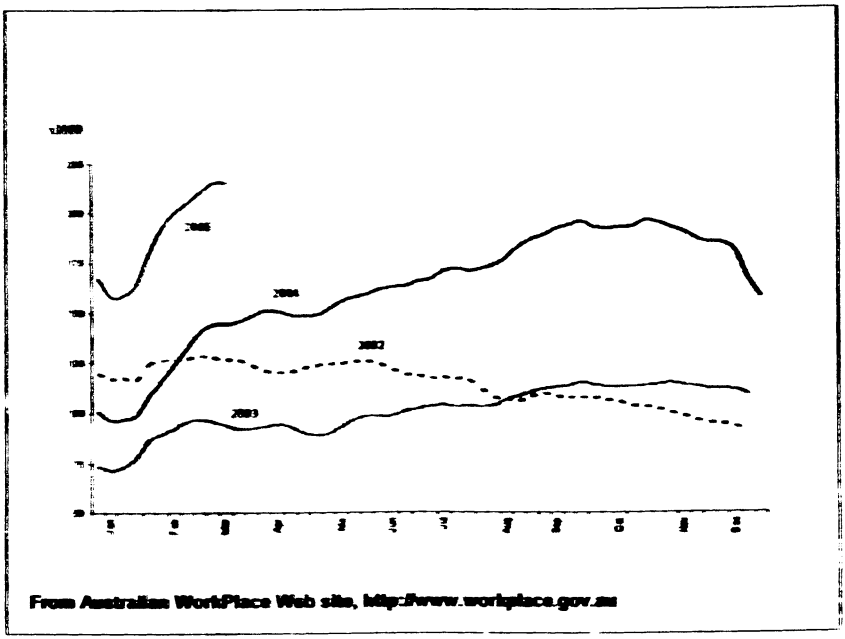

Figure 1. Information and Communication Technology Job Vacancy Index, by Month and Year

Employers are now approaching universities such as ours to try to ensure the supply of graduates into their organisations. Approaches have been

put in place such as cadetships, internships, summer employment, the employment of students part way through their courses, the giving of prizes, presentation of guest lectures, and the provision of part time tutors as possible, though not new, means of attracting students and bringing particular organisations to the attention of students. These methods worked well in the past and are being picked up again now. The shortage of IT graduates does not augur well for the future of the ICT-based economy but the situation may be reversed if students return to IT and if universities and businesses actively promote multiple ways through which students can be prepared to be active participants in the knowledge society. Interestingly, Gartner, as reported by Rachel Konrad states that "Many new entrants into the U.S. workforce see information technology jobs as monotonous, uncreative and easily farmed out – the equivalent of 1980s manufacturing jobs" [11]. She adds that: "Gartner researchers say most people affiliated with corporate information technology departments will be focused not so much on gadgets and algorithms but on corporate strategy, personnel and financial analysis".

There appears to be a demand for a broader range of IT professionals, arising from industry employers, current IT professionals and also from the students who hope to enter the IT industry. The changing demand is a reflection of the importance of the information economy and knowledge society and of some redefinition of the role of highly skilled technical experts (e.g., programmers). For example, increased offshore outsourcing of programming leaves an onshore role for "Jobs that require direct interaction with end-users or end-user hardware" [17], including requirements specification, design and prototyping [13].

Although the Department of Employment and Workplace Relations states that there is clearly now a demand for highly skilled technical professionals in the IT business [7], there is an increasing demand for experts in "Information" [7] with an interest in the business context of IT-based systems. As stated by the Australian Government's Productivity Commission, "There have been skill shortages. While basic ICT skills can be found or developed, some firms found it difficult to find people possessing higher-level ICT knowledge or skills, together with industry experience or business acumen" ([18], p12). "The inability to attract employees with the right mix of business management and IT skills to fully utilise the potential of ICT has been a constraint in some cases ... business managers do not always see the full potential for ICT use and IT managers are not focused on business strategy and vision" ([18], p79).

4. IT EDUCATION FOR THE KNOWLEDGE SOCIETY

The implications of this environment are that educational institutions must adjust their courses to offer opportunities to students at the undergraduate and graduate level and that they must use industry input to

design the most appropriate courses. A recent Australian Government report emphasises the need: "While the demand for formal ICT skills in many areas has fallen recently with the industry downturn, there is likely to be strengthened demand for high-level skills over the medium-term. ICT training should not just be focused on the acquisition of technical expertise, but should expose people to the broader economic and social environment in which their skills can be used. Greater emphasis on multi-disciplinary, business and project management skills is needed in both university courses and programs to assist SMEs [small to medium enterprises]. Greater industry involvement is also needed in ICT course design and delivery" ([5], p7-8). "Tertiary education institutions, individual businesses, and industry associations should work together to:

- Develop and design more flexible, responsive and targeted courses in ICT to provide for specific industry needs.
- More closely involve industry in education programs, for example through sponsorship, direct involvement in teaching, support for staff exchanges and secondments between industry and education institutions, and the provision of work experience for students" ([5], p13).

Our response has several dimensions. Our response has taken place within a stated understanding of the environment and desired outcomes: "ICT continues to impact the way we live. Increasing societal complexity is resulting, in part, from the adoption of new information technologies and we need a population that is savvy and critical to select the technologies that enhance their lives and use them well rather than to simply reject or blindly accept them. ... Our vision is of a society whose capability to act in a knowledgeable and responsible way is continually enhanced by its sophisticated use of information technologies. UC fulfills this vision through its ICT teaching, research and collaborations" [21].

The first step in our response was a set of ongoing discussions with industry and government experts, representing the primary employers of our graduates, a widely accepted process as indicated by the South Australian Centre for Economic Studies in [19], [17], [8]. These discussions take the form of brainstorming sessions and later targeted visits to stakeholders, to assist us in identifying key trends and potential student cohorts so that we can strengthen our undergraduate and graduate courses to support demand. The second step was to design and offer a new course to acknowledge the demand for a broader type of IT professional – the business analyst. The third was to examine how we can offer our courses in flexible ways and modes, in a variety of locations, satisfying a range of student life-styles and work requirements. The fourth step in our response was to benchmark our developments against other Australian universities and the literature to ensure that we are either leading in our approach or matching similar responses that are occurring.

This paper emphasises our response and contribution to the development of appropriate, relevant courses, and techniques to develop high quality, flexible teaching and learning resources.

5. CLIENT NEEDS – INDUSTRY AND GOVERNMENT PANELS

We ran panel sessions in March 2003 and May 2004 to discuss the needs of our clients. The purpose was to investigate industry and government requirements broadly and to consider a possible need to offer a new degree that focused generally on the role of the "Business analyst". We had ascertained in preliminary discussions and through a search of local job advertisements, that business analysis was an important area. We made sure that we had two business analysts on our panel but that we also had chief information officers, information managers and other IT specialists, including some of our own graduates. Each session had approximately 24 participants from industry, government and the university. Each session ran for 6 hours. In each session, we set up small groups to focus on issues, each group reported back and then the whole panel prioritised the outcomes. Overall, the following were identified:

- There is a continuing need for software engineers as developers, but the growing trend is to use off the shelf software where the need is to specify requirements and to plan the implementation of the software within the organisation.
- Many new systems will be knowledge-based rather than process-based.
- Other needs are to integrate existing systems, manage security and user identification, and project management.

The need was expressed as being for people who can bridge between business and IT areas and three, potentially overlapping, roles were identified:

- A person with a broad skills base (encompassing aspects of both management and IT) who can act as a business analyst.
- A person who can act as a communication channel between business and IT areas.
- A person who can integrate business systems, i.e., as a system architect.

Specific skills identified included financial understanding, marketing, statistics, change management, project management, contract management, knowledge management, end-to-end systems development management and testing, ethics, and generic skills including problem solving, business acumen, analysis skills, enquiring mind and interpersonal communication skills.

This first meeting was used as input to the design of a new course, the Bachelor of Business Informatics (BBI), described below, and a further

meeting was held in May 2004, to discuss IT growth areas and trends and the requirement for a graduate course similar to our new undergraduate course. This meeting confirmed some of our earlier input and included both previous panel members and some new ones. Growth and trend areas in IT identified in 2004 included:

- Security; testing; integration of systems, both internally and with other organisations; business process architecture; support for end-to-end business processes.
- The generic skills required to go with this including: entrepreneurial skills; ability to deal with ambiguity of requirements and ambiguity in the IT development environment (external to the organisation); intellectual property issues and the consequences of the misuse of data; an understanding that new technologies generate a call for new policies that need to focus on organisational as well as technical requirements; and advanced communication skills/ project management, to ensure that the right problem is identified and addressed.

Overall, the outcome of our panels led us to aim to strengthen aspects of our software engineering and IT courses and to satisfy a demand for IT professionals who understand processes and perspectives, work, ethical and social issues and who are facilitators, communicators, analysts, project managers and "Business-minded systems integration professionals" ([14], p39).

6. NEW COURSE DESIGN

Given the perceived need to develop a broader range of IT professionals than are produced through typical IT courses, we were encouraged by our university to create a new degree. Our current degrees, the Bachelor of Information Technology (BIT), and the Bachelor of Software Engineering (BSE), offered majors in software engineering, with specialised subjects in computer hardware, architecture and distributed systems and included a major in information systems, thus meeting many of the requirements of our clients. Our overall view of IT courses is shown in figure 2.

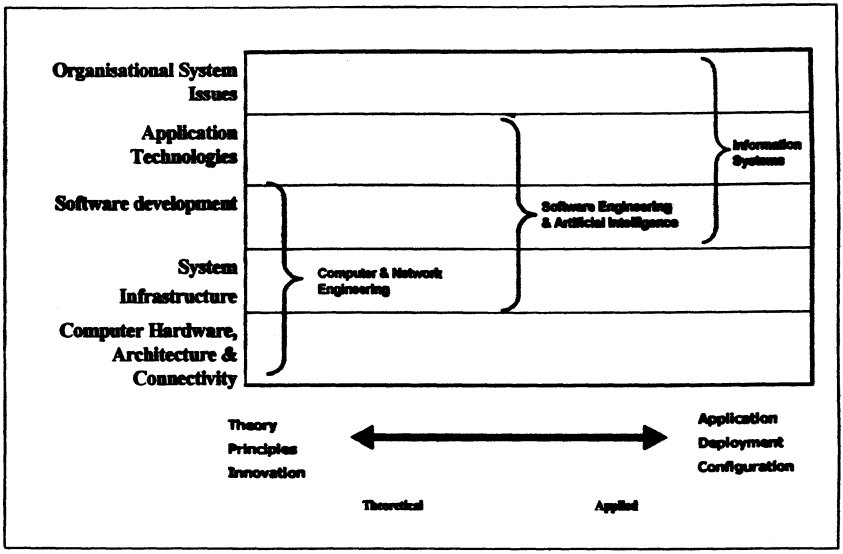

Figure 2. Areas Covered by our IT Courses

Our 2003 panel identified a considerable need for graduates who could bridge between software developers and business clients. The word "Business" emerged with some difficulty but is intended to cover government, commercial, non-government and not-for-profit organisations and community activities. We used a job title in common use in the IT world, "Business analyst", to generally describe the type of graduate who would be the focus of our new degrees. Overall, a business analyst was seen as a person who understands how organisations work, can understand the various perspectives of potential stakeholders in the systems design and development process, and is versatile enough to be a systems integrator of IT systems and related work-flow processes.

We felt that it was important to design an undergraduate course to meet the perceived demand. A survey of some universities that we considered to be similar to ourselves showed that there were some courses being developed that had this potential, reinforcing our decision to proceed.

6.1 Bachelor of Business Informatics

After considerable discussion with panel members we felt that it was important for our students to be able to gain employment at an entry level as a business analyst or potential project manager though such positions were often advertised at more senior levels. This led us, in 2004, to offering a degree, called the Bachelor of Business Informatics, built around an information systems major with supporting material drawn from the social sciences and business to provide a context and some perspectives for information systems development, integration and deployment. In most IT

courses there is not enough room for this range of material because of the emphasis placed on the technical aspects of programming, so that the Bachelor of Business Informatics provides a radically different emphasis while still being grounded in the IT discipline. To ensure employability at an entry level for new graduates, and a strong conceptual base for the course, we designed a core of subjects that develop strong modelling and written, oral and visual communication skills for students. The modelling skills learned relate to information systems modelling, organisational performance modelling, and generally workflow and business process modelling. A further step to strengthen their employment potential was to include a supervised, mentored internship in their final year, allowing the students to gain some work experience to reinforce theory through practice.

Apart from that, we wished to ensure that students could "Speak the language" and understand the perspectives of many of the potential stakeholders and understand the contextual issues related to technological change in the workplace. This determined the social science and business subjects we selected for the course The "Languages" learned include accounting, business statistics, management and law. The Business faculty commented that our Bachelor of Business Informatics did not contain a "Business" major. This caused us to reflect on exactly what we were doing and why We determined that our concern was to focus on "Languages" and that, if they so chose, students could pick up "Business" skills such as business finance, marketing and economics as electives. However, this still leaves open the question of what is meant by "Business". We are happy to have this left as a continuing question.

Students have the opportunity (in fact, requirement) to take four open electives through which they can choose to further develop skills and theoretical frameworks that are of particular interest to themselves. We conceptualised this in an interesting way, to give students an opportunity to think creatively about how to select electives. Typically, elective sequences are named after disciplines, for example a "Minor in economics" or a "Major in psychology" In this case we grouped some possible elective sequences under headings, for example "Professional areas such as: health (giving "Health informatics"), public sector management (Giving "Government informatics"); ...", "People and work practices: sociology, applied psychology, human resource management, communication, design: ...". "Business: accounting, economics, marketing, finance, entrepreneurship, applied statistics ..." and "Information Technology: software engineering, knowledge and information management" ([20], p161).

Two final business informatics electives from a limited list are also offered including Knowledge Management, Systems Testing, Information Security and related subjects These address our 2003 discussions, offering specialist subjects from which students can choose to match their career interests The resulting course structure which runs over three years is as shown in the table 1

Table 1. Three Year Structure of the Bachelor of Business Informatics

Year	Semester 1	Semester 2
1	Information Systems in Organisations	Database Design
	Introduction to Management	Business Statistics
	Accounting for Managers	Professional Communication Skills
	Open Elective 1	Open Elective 2
2	Designing Human-Computer Interaction	Systems Analysis and Modelling
	Organisational Behaviour	Systems Project & Quality Management
	Organisational Performance	Sociology of Technology and Work
	Open Elective 3	Open Elective 4
3	Business Informatics Internship (whole year)	
	Business Intelligence Systems	Business Informatics Case Studies
	Document and Workflow Management	Information Law
	Business Informatics Elective 1	Business Informatics Elective 2

Considerable thought was put into choosing a name for this degree. We wanted a name that might have broad appeal, indicate what the degree is about but leaves room for development. In selecting the name "Business Informatics" we are aware that it has a range of meanings and can even be confusing. However, we felt that it was better than names such as Bachelor of Information Systems or Bachelor of Management Information Systems or Bachelor of Business Analysis (etc.) all of which have several meanings (for example, Bachelor of Information Systems degrees are often very technical in the programming sense) and felt limiting. We have settled on the name Bachelor of Business Informatics because of its scope for suggesting an interest in other informatics areas such as health informatics, government informatics, etc and the possibility that we can link with other parts of our university and with the community in developing degrees that have a similar approach to informatics but in different professional areas.

The Business Informatics Internship was the subject of a further panel discussion in 2004. We convened a panel that again had some previous panel members and some new ones to make sure we got both continuity of ideas and new perspectives. The ground rules were that the internship would occupy the student workload of two subjects over 1 year, amounting to 240 hours of work placement plus seminar work on campus.

This panel emphasised several points:

- The need to be flexible about when an internship took place and the pattern of hours of contact so that employers and students were happy with any particular arrangement.

- The need to set up a "Learning agreement" between the student and the employer so that the experience was well-designed and focused on mutual learning.
- The need to have students take an active role in finding an internship position so that they have a strong commitment to it.
- The need to ensure that the practical issues are addressed such as a desk, a space and a computer for the use of the intern.

The internship program was designed based on this input and the experience of those running and involved in an internship program in public relations.

This course, the Bachelor of Business Informatics, was first offered in 2004 and its equivalent graduate course, the Master of Business Informatics, was first offered in 2005. At the same time, we further responded to industry input and redesigned our BIT and BSE, retaining their software engineering and information systems base and offering new subjects such as Security and Support in IT, System Testing, Web Design and Programming, Document and Workflow Management and Information Security. The BIT remains a general IT degree and the BSE is more technical. In 2005, these two redesigned degrees were also first offered. See:

- http://www.canberra.edu.au/courses/index.cfm?action=detail&courseid=706AA, (BBI).
- http://www.canberra.edu.au/courses/index.cfm?action=detail&courseid=322AA, (BIT).
- http://www.canberra.edu.au/courses/index.cfm?action=detail&courseid=560AA, (BSE).
- http://www.canberra.edu.au/study/courses/new/mbi.html, (MBI) for details.

7. FLEXIBLE DELIVERY AS AN ISSUE IN COURSE DESIGN

We have had a changing cohort of students, most noticeably since about 1990. Students increasingly have a considerable workload from paid work and many have full time work and are part time students. Students frequently travel with their work and we have many students from overseas who may need to travel home on occasion while keeping in touch with their study material and cohort members. IT infrastructure has also changed. Our students undertake group work (seen as an important skill in IT) and need to take advantage of groupware and other collaborative technologies so that they can define their own ways of working. These issues have led to our offering increasing support for flexible learning. For example, we offer face-to-face teaching as our primary mode of engagement but support this with online

materials and workspaces, and discussions. We also develop students' skills in computer supported cooperative work. Occasionally we offer an entirely online subject but have not found this to be widely useful for IT our subjects.

A further issue in flexibility is the scheduling of classes. The students coming into our Master of Business Informatics (MBI), for example 19 in the first intake, are typically currently practicing as business analysts and wish to gain formal qualifications in that area. A key issue here, especially for students with full time work, is to offer subjects at times and in patterns that suit the students, with suitable online support. One of our panel members from the Australian Bureau of Statistics (ABS) offered to run a survey of their IT professional staff to see if there was any interest in our graduate studies in IT and also to ask what study patterns would be of interest. The survey results were interesting but not conclusive.

Table 2. Survey of those ABS Staff who had a 50% Chance or Greater of Undertaking Further Study, 1-7 = 1st to Last Choice, 0 = no Response

Preferences	total	1st	2nd	3rd	4th	5th	6th	7th	0
Daytime, one 3-hour session each working week.	53	18	13	4	4	3	1	0	10
Evening, one 3-hour session each working week.	53	18	13	5	7	2	0	0	8
One ½ day session on 7 Saturdays.	53	6	7	15	5	0	1	0	19
One ½ day session on 7 Saturdays.	53	3	7	7	5	9	2	0	20
Three 2-day blocks over 3 weeks	53	5	7	8	5	7	0	1	20
Some other method.	53	2	1	0	1	0	2	1	46
No opinion.	53	1	0	1	1	1	0	0	49

The data shows that students prefer to come during work hours or after work during the week. Typically, we offer the latter choice but we also offer one of the least preferred choices, that is, one half day session on seven Saturdays (that is, one session every two weeks) over a semester period. This matches a pattern offered by our Master of Business Administration and has proved quite popular in that, of the 14 students studying the subject on offer on Saturday, 12 of them took the Saturday class and 2 took a weekday evening class. None of these participants is from the Australian Bureau of

Statistics. The ABS and some other government departments give staff time off during the day to attend classes and some other employers do not. This may explain the apparent difference between preferences and reality.

Apart from class scheduling, we offer other forms of flexibility including online material from which students prepare for classes, and flexibility in assignment topics to match the interests of participants. We also use knowledge-based subject design to develop a shared resource from which several staff members can "Deliver" the same subject to different cohorts in different places at different times.

8. BENCHMARKING OUR RESPONSE

An Australian survey of employers in 2000 shows that they would like universities to address certain areas in their development of IT graduates. These include project management, oral and written communication skills for communicating with clients, real-life projects, work experience, business skills and technical skills [9]. Our response, in our undergraduate and graduate courses, aligns with the requirements indicated by this survey. Apart from points already discussed in relation to our Bachelor of Business Informatics, we have also included project management in all our courses and have "Real-life projects" as capstone subjects in our Bachelor of Information Technology and Bachelor of Software Engineering. A multinational survey related specifically to software engineering shows significant differences between formal education and workplace learning and professional requirements [12]. For example, ([12], p99) shows significant gaps in areas including negotiation, presentation skills, analysis and design methods, testing, ethics and professionalism, and project management. A student taking our double degree (Bachelor of Software Engineering/ Bachelor of Business Informatics) would be highly skilled in software engineering and these related areas.

A survey of eleven Australian universities and several other educational institutions by the South Australian Centre for Economic Studies in 2001 supports both our approach to course design and our emphasis on new areas of importance. The study shows that it is typical for universities to consult with industry panels to develop courses and to provide internships, placements, sandwich courses and cadetship-based education places ([19], p 106-7).

A series of short papers in IEEE Computer also generally supports our process and emphasis. Although there are differences (because of the IEEE's particular emphasis on computer science and software engineering), issues related to the overall process and to employment and the need to understand business processes are common [17], [8], [13].

It is not new to say that IT professionals need to understand business but it is new to put together a course like the BBI and the MBI with their

emphasis on modeling, on context and the "Languages" of people and organisations. Other approaches include offering double degrees with business/ management or incorporating some IT into business, management, health, education and other courses.

Apart from these independent surveys, which appear to validate our approach, we also looked at courses currently on offer at many Australian and some overseas universities. We visited several Australian universities to compare ideas with them about IT courses, the teaching of communication skills and flexible learning. In all cases we found the comparisons rewarding and we considered ideas we found in comparable institutions in designing our courses and class schedules. We have undertaken this benchmarking process in conjunction with reference to the accreditation requirements specified by the Australian Computer Society; their requirements align with bodies of knowledge requirements generally specified by IEEE and, for example, the Association of Computing Machinery (ACM). We believe the outcome for our community is on track, while always being under review.

9. EXPERIENCE AND FEEDBACK

When we commenced our course design (Bachelor of Business Informatics (BBI) and Master of Business Informatics (MBI)) and redesign (Bachelor of Information Technology (BIT) and Bachelor of Software Engineering (BSE), plus graduate courses, Master of Information Technology and Master of Technology), we were in a position that is typical of many Australian universities, in that our student numbers in IT were falling. This is most clearly shown in our BIT degree though the numbers in the BSE have risen (Figure 5). This increase in the BSE is encouraging but the numbers overall in our two long-standing IT degrees remain lower than in 2001. The more technical the degree, the fewer the number of females. And, in these courses, the percentage of females is falling. The positive data is that, at least initially, the Bachelor of Business Informatics appears to be attracting a higher percentage of females. This is one dimension of our interest to attract a wider range of people to our IT courses and hence to the business of supporting the knowledge society.

The first offering of our courses has been successful and we have had our first group of BBI interns this year, 2005. Some students changed to the BBI from courses such as the BIT and BSE saying that they are interested in computers but don't want to be programmers, rather, they want to work with computers to undertake typical business analysis tasks. Initial enrolment data for the BBI is included below in table 3.

Table 3. Actual Enrolment Numbers at the Beginning of Each Year by Gender with % Female

Year	BIT	BIT	BIT	BSE	BSE	BSE	BBI	BBI	BBI	BIT	BSE	BBI
	female	male	total	female	male	total	female	male	total	%female	%female	%female
2001	159	454	613	5	35	40	0	0	0	25.9%	12.5%	
2002	134	400	534	4	51	55	0	0	0	25.1%	7.3%	
2003	110	346	456	5	57	62	0	0	0	24.1%	8.1%	
2004	79	258	337	4	53	57	5	17	22	23.4%	7.0%	22.7%
2005	53	184	237	4	66	70	19	30	49	22.4%	5.7%	38.7%

We have had considerable feedback from students in the BBI in particular. Students value the strong modelling skills developed through their information systems subjects (particularly Systems Analysis and Design, Document and Workflow Management) and find the contextual subjects useful (mainly Organisational Performance, Sociology of Technology and Work). They have also learned several "Languages" of business for example, through the subjects Information Law, Introduction to Management, Accounting for Managers and Business Statistics, making them able to readily adjust to their experience of the workplace in the internship. This has been reinforced by communication and teamwork subjects, specifically Professional Communication Skills and Organisational Behaviour. This has been confirmed by their internship employers. Our new IT electives have also proved popular across all courses, particularly System Testing and security subjects such as Computer and Network Security, Information Security, and Security and Support in IT.

We have also had positive feedback from the employers of our internship students. Students undertake the Business Informatics Internship in their final year and work for 240 hours, usually without payment (exceptions occur if the internship is undertaken at their place of current employment). The employers are now asking for more students and express delight with those they have already taken on. They appreciate the broader view of these students while also requiring some with a "More technical", that is, programming, background. Our BIT and BSE students remain in demand and employers see these graduates as having strong technical skills (programming and distributed systems) combined with broader analysis, design and project management skills. Students are now showing an interest in the Bachelor of Software Engineering/ Bachelor of Business Informatics double degree. Discussions with employers who have been panel members indicate that our course design has addressed their specified input and requirements at the undergraduate and graduate levels.

10. SUMMARY

We aim to educate IT professionals who will facilitate a knowledge society through the design of work practices, business processes and IT-based systems, informed by government, business and community requirements. Through our consultative processes, we have gained considerable insight into the way universities can contribute to this, particularly through course design. We have designed new courses and redeveloped current ones that support the knowledge society. At the same time, we have become participants in the knowledge society by using IT infrastructure to support the flexible learning requirements of students and flexible subject design and presentation by staff. This is a continuing process that evolves with our understanding of the knowledge society.

11. ACKNOWLEDGEMENTS

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